H-495

MODEL V-089

VECTORSCOPE

OPERATION MANUAL

Hitachi Denshi, Ltd.

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CONTENTS

1.	Features	3
2.	Precautions	3
3.	Composition	9
4.	Specifications	10
5.	Panel controls	13
6.	Operation	18
7.	Vectorscope	21
8.	Schematic diagrams	22

NOTE

- This instrument should be adjusted at an ambient temperature of +20°C for best overall accuracy.
  Allow at least 15 minutes warmup before proceeding.
- To clean the enclosure or the front panel, use neutral detergent. Refrain from using thinner, benzine, alcohol or other chemicals.
- For safety operation, the instrument chassis and cabinet are sure to connect the ground lead of the GND (ground) terminal to earth ground, if a two-wire AC power system is used.
  Failure to complete the ground system may allow the chassis and cabinet of this instrument to be elevated above ground potential and pose a shock hazard.
- Subjecting this instrument to severe mechanical vibrations or using it in intense electrical fields can cause jittering waveforms and severely inclined traces.

  Avoid using the instrument near high-power electrical equipment.

  The scale illumination lamp brightness may vary under the effect of intense mechanical vibration and may even experience an open filament, so that such operational environments should be avoided.

1. FEATURES

The **Hitachi Model V-089** is an NTSC system compact vectorscope, using a 3 1/2-inch high intensity rectangular CRT display.

The V-089 vectorscope is designed to monitor the output signal from such devices as TV cameras, VTRs, and CCTVs. It offers the following features.

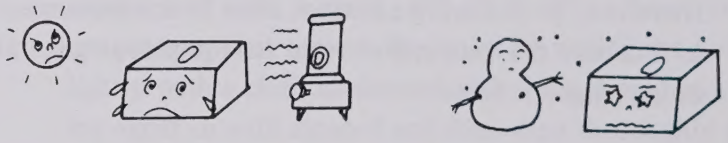
- ○ Three units are mountable side-by-side in a standard 19-inch rack.
- ○ The equipment operates on three different power supplies; AC power, external DC power and the optional AD-099 battery pack.
- ○ Focusing shift is automatically corrected.
- ○ Either of two loopthrough video inputs may be selected for display from the front panel.
- ○ A built-in test circle function enables to inspect the phase and amplitude.
- ○ Either internal or external synchronization is selectable from the front panel, and the external inputs are a loop-through type.

2. PRECAUTIONS

Precautions to be observed to lengthen the service life of this instrument.

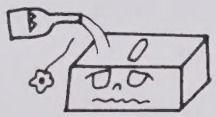
Installation site

* Avoid installing instrument in an extremely hot or cold place.
  - ○ Avoid placing this instrument in place exposed to sunlight for a long period of time, in a closed car in midsummer, or near a room heating device such as a stove.
  - ○ The operating maximum ambient temperature is +40°C.
* Do not use instrument that has been left outdoors on a cold winter day.
  The operating ambient temperature is 0°C or more.

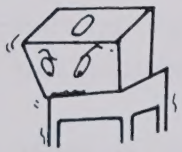


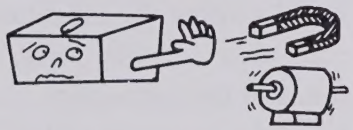
* Avoid moving the instrument rapidly from a hot place to a cold place on vice versa, or condensation may form on inside of the instrument.
* Keep the instrument away from damp air, water, and dust. Unexpected trouble may be caused when the instrument is placed in a damp or dusty place.

The operating ambint humidity is 35–85%.
Since an accidental intrusion of water may also cause troubles, do not place a water-filled containers such as a vase on the vectorscope.



* Do not place the instrument in a place where vibration is strong. Avoid using the instrument at a place vibrating violently. Since the vectorscope is a precision instrument, excessively strong vibrations may cause damage.
* Do not place the instrument near a magnet or magnetic body. An vectorscope is an equipment using electron beam. Therefore, do not bring a magnet close to the instrument or do not use the instrument near an equipment generating strong magnetic force.

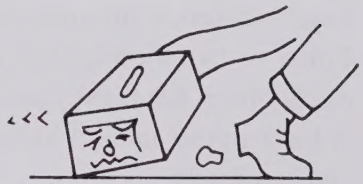




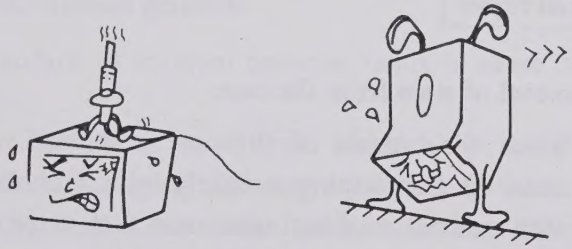
Handling

* Do not put a heavy objects on the vectorscope.
* Do not block the ventilation holes.
* Do not apply a heavy shock to the vectorscope.

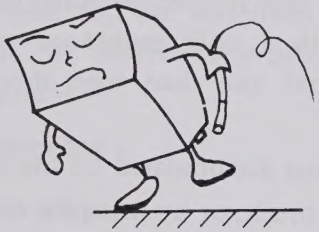
* Do not insert a wire, pin, etc. through the ventilation hole.
* Do not drag the set, leaving the probe attached to it.



* Do not leave a hot soldering iron on the cabinet or the screen.
* Do not try to turn the instrument upside down. Otherwise, knobs may be broken.



* Do not use the instrument upright, leaving BNC cable connected to VIDEO INPUT, EXT SYNC INPUT EXT DC IN terminal on the rear panel. Otherwise, the cable may be damaged.



When not in use

When not in use, the instrument should be carefully stored in a dry, dust-free location.

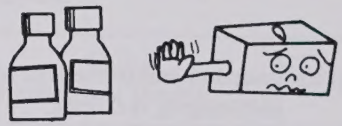
When operation is faulty

Recheck the operating procedure and if problem persists, cannot a nearly service station or agent.

Care and repair

* **Removal of stain from the case**
  - When the outside of the case is stained, remove the stain by first wiping it lightly with a cloth moistened with neutral washing agent and then wipe the surface with a dry cloth.

* **Never use strongly volatile agent such as benzine and thinner.**



  - When the panel surface is stained, remove the stain in similar way with a clean, soft cloth. When heavy stains are present, first remove the stains by wiping the surface lightly with a cloth moistened with diluted neutral washing agent or with alcohol and then wipe thoroughly with a dry cloth.
  - When dust has accumulated on the inside, remove it by using dry brush, or by using the exhaust of a compressor or a vacuum cleaner.

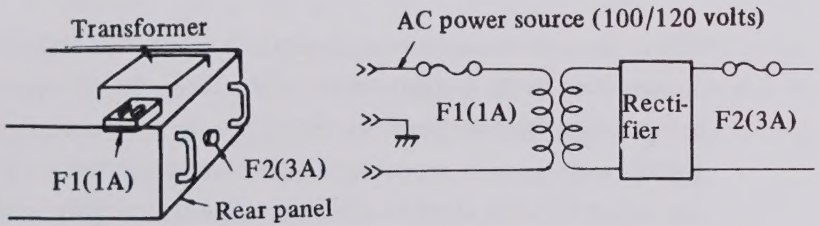
NOTE: When opening the case, pull out the power supply plug beforehand without fail.

When cleaning the inside, insure beforehand that no electricity remains in the condensers of the power supply circuit.

When operation is faulty

* Recheck the operating procedure and if problem persists, contact a nearly service station or agent.
* Only our authorized serviceman can provide the repair and recalibration except exchanging the fuses.

Fuse location and procedure for exchanging the fuses.



F1(1A): Remove the cover of the fuseholder and put on after exchanging the fuse.

F2(3A): Remove the cap of the fuseholder by turning counter-clockwise (against the arrow).
≪ Disconnect any power source before exchanging the fuses.≫

Care and repair

* **Removal of stain from the case.**
  - ○ When the outside of the case is stained, remove the stain by first wiping it lightly with a cloth moistened with neutral washing agent and then wipe the surface with a dry cloth.
  - ○ When the panel surface is stained, remove the stain in similar way with a clean, soft cloth. When heavy stains are present, first remove the stains by wiping the surface lightly with a cloth moistened with diluted neutral washing agent and then wipe thoroughly with a dry cloth.
  - ○ When dust has accumulated on the inside, remove it by using a dry brush, or by using the exhaust of a compressor or a vacuum cleaner.

NOTE: Before removing the covers, disconnect any power source beforehand without fail.
Dangerous voltage, capable of causing death, are present in the V-089.
Use extreme caution when handling without the cover.
When cleaning the inside, insure beforehand that no electricity remains in the condensers of the power supply circuit.

* **Clean of external graticule**

Dirty surface of external graticule tends to cause measuring erros.

Remove the stains on external graticule by using a clean and soft cloth, paying attention not to impair them.

When the stain is extremely heavy, wash them with neutral washing agent and then leave the stand until the moisture is removed naturally.

- If the screen is installed while it is moistened, water rings may be formed and the waveform may be blurred to become hard to observe. Pay attention not to leave finger prints on it.

Cautions before operating

* **Check the power source**

The operating voltage range of this instrument is as follows. Check the power source voltage without fail before connecting to any power source.

AC power source voltage	100: 90–110 volts
	120: 108–132 volts
External DC power source voltage (at EXT DC IN terminals)	11.5–14 volts

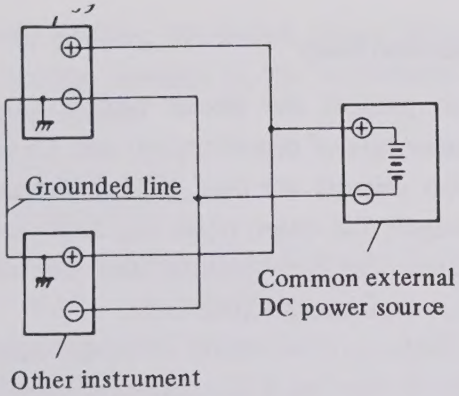
* **Use only specified fuses**

In order to protect the circuit against over-current, a 1A (in primary side of power circuit) and 3A (in secondary side of power circuit) are used. When the fuses blow out, check thoroughly the cause, repair any faulty point present, and then replace with a specified fuse. Do not try to use the fuse other than the specified ones.

Otherwise, fault may be caused or danger may be invited. (Particularly, do not use a fuse different from the specified one in current capacity and in length.) The standards if the fuses are as follows.

	Shape (Diameter x length) mm	JIS type name
3A (Secondary)	6.35ϕ x 31.8	MF61NM250V 2A AC
1A (Primary)	6.35ϕ x 31.8	MF61NM250V 1A AC

* - (negative) terminal of EXT DC IN is inside connected to case ground. Do not connect - (negative) terminal of the V-089 to the + (positive) grounded case of other instruments with common external DC power source to the V-089. If not, it is very dangerous because a large current flows through the grounded line.



≪ DANGEROUS CONNECT ≫

* Do not apply reverse polarities to EXT DC IN.
* Do not increase the brightness too much.
  Your eyes may be strained and the fluorescent surface of CRT may be burnt.
* Do not apply an excessive voltage.
  The maximum voltage of each input is as follows.

Never apply a voltage higher than specified.

VIDEO INPUT	±5 volts DC
EXT SYNC INPUT	±5 volts DC

Calibration interval

To maintain instrument accuracy, perform the calibration of the V-089 at least every 1,000 hours of operation, or every six months if used infrequently.

3. COMPOSITION

Composition of the Model V-089 is as follows.

(1) V-089 vectorscope 1
(2) AC power cable. 1
(3) Fuse 250V 3A 1
250V 1A 1
(4) Operation manual 1

SPECIFICATIONS

○ CRT

Type 95CB31 (3.5-inch rectangular CRT with external graticule)

Accelerating voltage

Approx. 2kV

Scale illumination

Operates with AC line power or an external DC power source.
Does not illuminate when the V-089 is powered from the optional AD-099 battery pack.

○ CHROMINANCE

Frequency response

Subcarrier frequency (Fsc = 3.57945 MHz
Upper -3dB point = Fsc + 500kHz ±100Hz
Lower -3dB point = Fsc -500Hz ±100kHz

Vector phase accuracy Within 2°

○ SUBCARRIER REPRODUCTION

Pull-in range

3.579545MHz ±100Hz (20 to 30°C)

Pull-in time

Within one second

Phase error due to variation in Fsc

Within 1° for ±50Hz variation in Fsc

Phase shift with burst amplitude variation

Within 2° for ±6dB

Gain control variation phase error

Within 1° for ×1 to ×2
Within 1° for ×1 to ×0.5

Burst jitter

Within 2°

Phase control range

360° or greater

Input amplitude range

1V ± 6dB

Maximum input voltage

± 5V

Variable gain range

0.5x to 5.0x

Gain stability

±2%

Clamp stability

Within 1/8 inch for a central spot
Within 1/64 inch with phase control

Input separation

40 dB or greater between channel

Return loss

40 dB or less, up to 5MHz

○ TEST CIRCLE

Amplitude of 100 IRE ± 2%

○ EXTERNAL SYNC

Input signal

Requires composite input signal of 1.6 to 4.5V

Input impedance

15kΩ

Maximum input voltage

± 15V

○ POWER REQUIREMENT

AC line power

100VAC ± 10%, 50 to 400Hz
or 120VAC ±20%, 50 to 400Hz

External DC supply

11.5 to 14VDC (Applied to the EXT DC IN terminals) The optional AD-099 battery pack may run for two hours of continuous operation.

Power consumption

Approx. 30W (for AC line power operation)

○ ENVIRONMENTAL CONDITIONS

Operating temperature

0 to +40°C (+50 to +104°F)

...midity

35 to 85%

Temperature range for guaranteed specifications

+10 to +30°C (+50 to +80°F)

Storage temperature

-15 to +60°C (5 to 140°F)
-15 to +35°C (using the V-089 in combination with the AD-099 Battery Pack)

Dimensions

Approx.
145(W) x 88(H) x 395(D) mm
(5.7 x 3.5 x 15.5 in)

Weight

Approx. 4kg (8.8 lb) (V-089 only)
Battery pack weighs approximately 2.5 kg (5.5 lb)

Options

19-inch rack mount (accommodates three units mounted horizontally)

○ **AD-099 battery pack**

AD-099 uses Ni-Cd batteries with the following specifications:

Nominal capacity	3500mAh
Nominal voltage	12V
Discharge terminal voltage	10V
Charging current	350mA
Charge time	Approx. 15h

5. PANEL CONTROLS

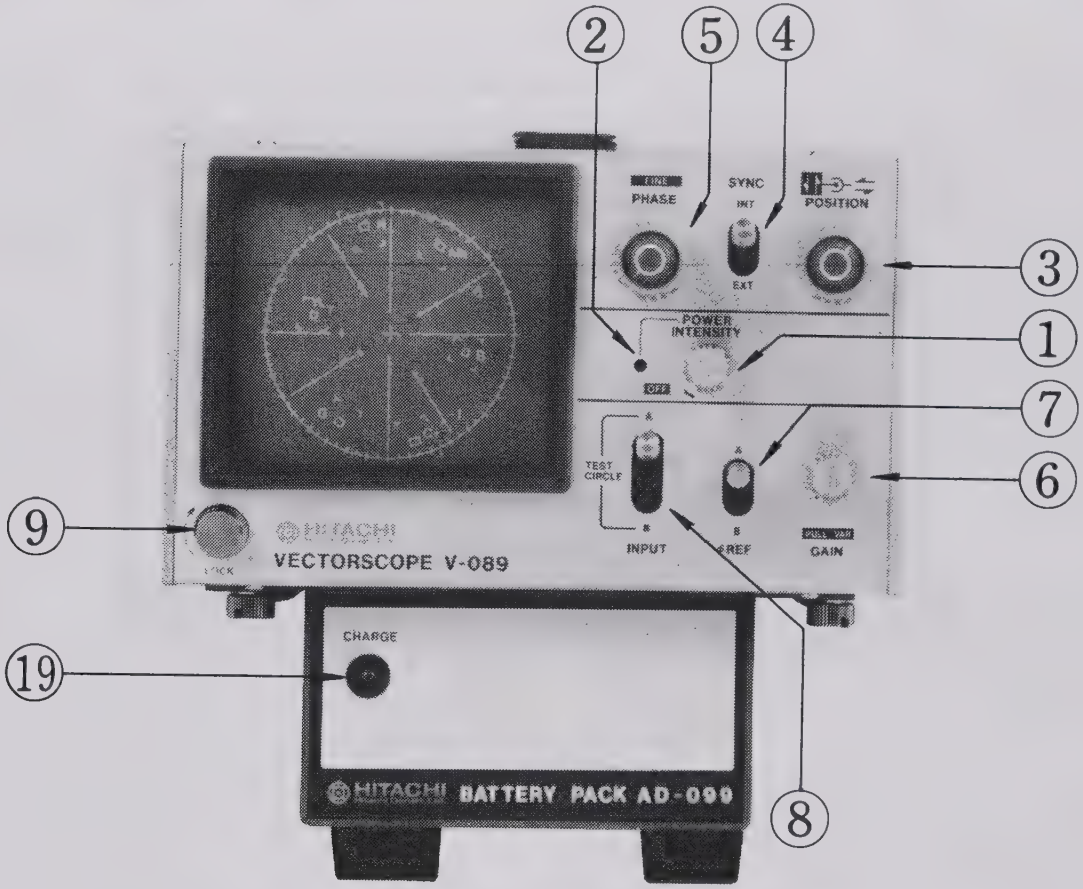


Fig. 5-1 Front panel

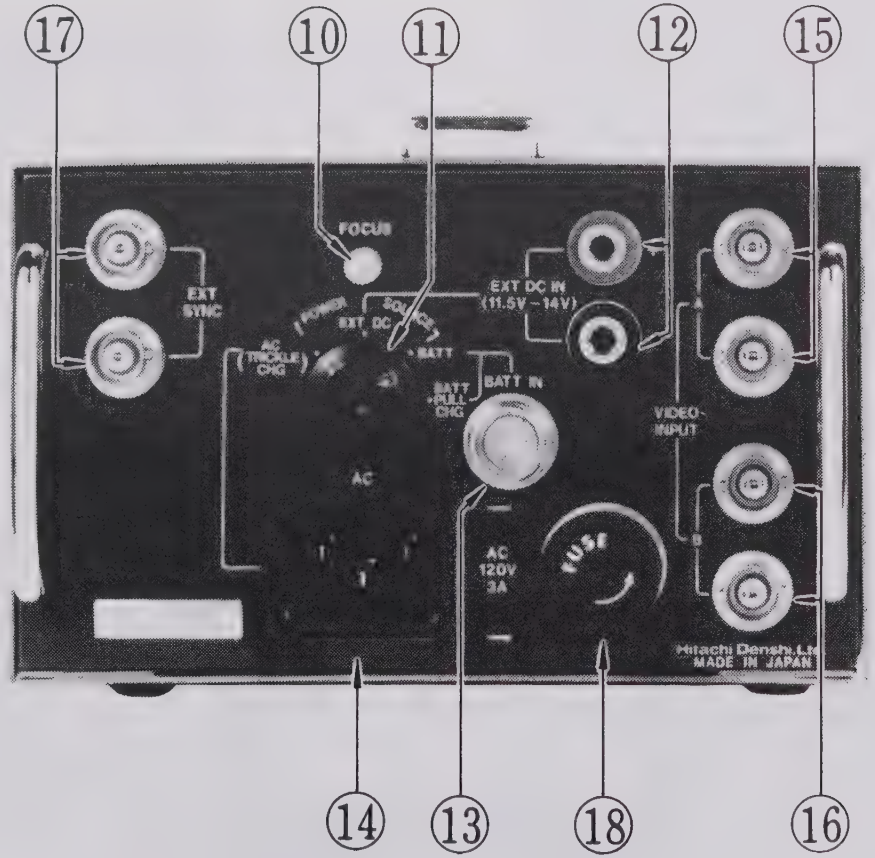


Fig. 5-2 Rear panel

FRONT PANEL

① POWER/INTENSITY

This controls the power on/off operation and also controls the brightness of the CRT display. The power is turned off when the control is in fully counterclockwise position, and turned on when turned clockwise. Brightness increases as the control is turned in the clockwise direction. Defocusing by intensity changes is automatically corrected.

② Power Lamp

This lamp lights when the power is set on. It flashes when the power voltage is low, as a warning indication. It will be extinguished completely when the power supply voltage drops further.

CAUTION!

When using the V-089 in conjunction with the AD-099 battery pack, discontinue use of the V-089 and charge the battery by setting the POWER SOURCE control on the rear panel to the BATT FULL CHG position as soon as the power lamp begins flashing. Failure to do so may cause damage to the battery.

If the power voltage falls lower yet, the lamp will extinguish and the DC/DC converter in the V-089 audibly vibrate. This is not a sign of trouble.

③ POSITION

This is a double control, the larger knob is used to adjust the horizontal position. Clockwise rotation moves the vector to the right and counterclockwise rotation moves it to the left. The smaller knob is used to adjust vertical position; clockwise rotation moves the vector upward and counterclockwise rotation moves the vector downward.

④ SYNC (INT/EXT)

This selects internal or external sync.

⑤ PHASE/FINE

This is the vector phase adjustment. Clockwise rotation causes clockwise phase change and counterclockwise rotation causes counterclockwise phase change of the vector. It is a double control, with the larger knob used for a course control and the smaller knob used for a fine control.

⑥ PULL VAR/GAIN

When pulled out, this knob provides a minimum of x0.5 to x5 continuous vector amplitude adjustment. When pushed in, the vector amplitude is calibrated at x1.

⑦ φREF (A/B)

This switch is used to select the subcarrier of either the VIDEO INPUT A or VIDEO INPUT B input video signal as a reference.

⑧ INPUT (A/TEST CIRCLE/B)

This switch is used to select VIDEO INPUT A, VIDEO INPUT B, or the built-in TEST CIRCLE as the input signal.

⑨ LOCK

This locks the chassis to the 19-inch rack mount.

REAR PANEL

⑩ FOCUS

This is the focus control. While defocusing caused by INTENSITY change is automatically corrected, this control can be used for defocusing caused by prolonged operation and initial focus adjustments.

⑪ POWER SOURCE (AC TRICKLE CHG–EXTDC–BATT–BATT FULL GHG)

This switch is used to select any of the following power sources.

AC (TRICKLE CHG): For AC power line operation. When the AD-099 battery pack (optional) is used with the V-089, this mode provides a trickle charge for the AD-099.

EXT DC: This position provides operation from an external DC power source of 11.4 to 14V (approx. 1.3A). When using an external DC power source, set the voltage within the range of 11.4 to 14.0V, and take extreme care that the polarity of the external power supply is not connected reversed to the V-089 and that the positive (+) terminal is not shorted to ground.

BATT: This position provides the operation from the optional AD-099 battery pack.

BATT FULL CHG:

This position provides charging of the AD-099 battery pack (option). Note that, during the charging operation, the V-089 may not be operated. The time required from the point at which the power lamp begins flashing until the charge is completed is at least 15 hours.

CAUTION!

This negative terminal of EXT DC IN is internally connected to the V-089 chassis.

⑫ EXT DC IN ±

This set of terminals is used to supply the external DC power source.

CAUTION!

Do not connect the external DC source with reversed polarity.

⑬ BATT IN

This connector connects the AD-099 battery pack.

⑭ AC

This connector connects the AC line power source.

⑮ VIDEO INPUT A

These BNC connectors are used to apply the video input A.
Note that these connectors are meant for the video signals only and should not be used for the subcarrier signal.
The inputs are loopthrough types and should be terminated with 75Ω.

⑯ VIDEO INPUT B

These BNC connectors are used to apply the video input B.
Note that these connectors are meant for the video signals only and should not be used for the subcarrier signal.
The input are loopthrough types and should be terminated with 75Ω.

⑰ EXT SYNC

These BNC connectors are used to apply the external composite sync signals. The input are loopthrough types and should be terminated with 75Ω.

⑱ FUSE

This is the 3A secondary circuit protective fuse.

⑲ CHARGE (Option)

This lamp lights when the AD-099 battery pack is charging.
It does not light during trickle charging.

6. OPERATION

The operation procedures described below using 1V color bar signal.

1. Rotate the POWER/INTENSITY knob (1) fully counter-clockwise.

2. Set the POWER SOURCE switch (11) to the AC (TRICKLE CHG) position.

3. Check that the AC line voltage has been set to 90 to 110V or 108 to 132V, whichever is appropriate.

4. Connect the V-089 vectorscope to an AC line power source.

5. Set the V-089 vectorscope front panel controls as follows.

POSITION	CENTER
PULL VAR	Pushed in
SYNC	INT
ϕ REF	A
INPUT	A
PHASE	Any position

6. Set the POWER/INTENSITY (1) to the center position. After several minutes, the trace line will appear. Adjust it for an appropriate intensity by the POWER/INTENSITY knob (1).

7. Apply a 1V color bar signal at the VIDEO INPUT conector A (15).

CAUTION!

The output of the video signal distribution system must be terminated with 75Ω. If the V-089 vectorscope is connected to the output side, terminate the other (unused) VIDEO INPUT connector A with 75Ω.

8. Set the INPUT switch (8) to A.

9. Set the ϕREF switch (7) to A.

10. Turn the POSITION knob (3) so that the central beam spot is positioned at the crossing point of the center scale of the CRT screen.

11. Turn the PHASE knob (5) so that the burst signal component corresponds to the horizontal scale line at the left of the CRT screen (refer to Fig. 6-1).

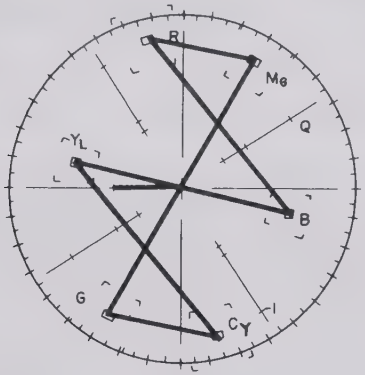


Fig. 6-1 Burst signal component coincides with the horizontal line.

12. AD-099 battery pack operation

Connect the AD-099 battery pack connector to the V-089 vectorscope rear panel BATT IN connector (15).

The V-089 will then be powered by the batteries included in the battery pack. This type of connection will allow approximately two hours of continuous operation.

Operation for longer periods will result in a sudden drop of the voltage at the power supply terminals and a over discharge condition. Just before this condition arises, however, an alarm, in the form of a flashing power lamp, appears on the V-089 vectorscope panel.

When this alarm is noticed, immediately turn off the POWER/INTENSITY switch (1) and charge the AD-099.

Battery Charging

(1) Battery charging is performed with the battery pack connected to the V-089 vectorscope.
Connect the AC power cable to the AC line power source and set the V-089 POWER/INTENSITY switch (1) to OFF, the POWER SOURCE (13) to BATT FULL CHG to begin charging. Complete charging will require approximately 15 hours.

(2) When using the AD-099 battery pack in conjunction with the V-089 in the POWER SOURCE AC (TRICKLE CHG) position, the battery pack will be slowly charged, allowing battery operation to be made at any time when required.

For using the Battery Pack

Care should be taken not to short the positive and negative terminals of the battery pack and not to throw the battery pack itself into a fire.

a) To ensure long battery life, charging should be done at an ambient temperature of 0°C to +40°C (37 to 104°F) and should not be done for more than three days in a row or continuously for more than 48 hours. This type of charging will shorten battery life.

b) Storage of the battery pack for long periods (one month or more) should be done, in a temperature range of -15°C to +35°C (5 to 98°F) in a dry, cool, and dark location.
When using the battery pack after long periods of storage, it should be charged for approximately 15 hours, since the batteries self-discharge during storage.

c) Avoid shorting the positive and negative terminals of the battery as this can cause an explosion.

d) Do not discard old batteries into a fire as this can cause explosion. Batteries should not be disassembled, since the fluid contained therein can harm skin and clothing.

e) The life of the battery pack depends upon the ambient temperature and load conditions and particularly the length of continuous periods of use. The life should normally, however, be approximately 300 charges, allowing approximately one year of use with one charge per day. Beyond this useful lifetime, operating time will fall even if a normal charging period of approximately 15 hours has been observed, at such point a new battery pack should be used.

f) When the battery pack is used as a spare battery for emergency operation, periodic charging (for about 15 hours) is required once a month.

7. VECTORSCOPE

This displays the amplitudes and the phases of chrominance signals, using the R-Y and B-Y axes on the CRT.

The proper ranges for the phases and amplitudes corresponding to the three primary colors; red, blue and green, and complimentary colors; cyan, yellow and magenta remarked on the scale screen.

The inner mark □ indicate the phase within ±2.5° and the amplitude within ±2.5 IRE. The outer mark [ ] indicate their limits of allowance: ±10° for the phase and ±20 IRE for amplitude.

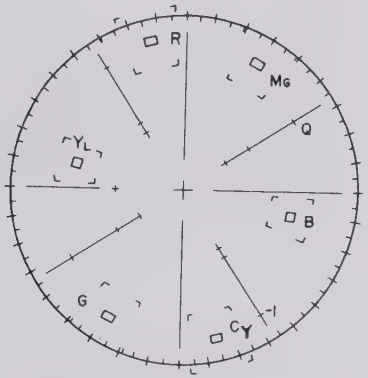


Fig. 7-1 Burst markings

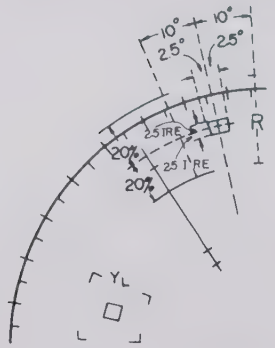
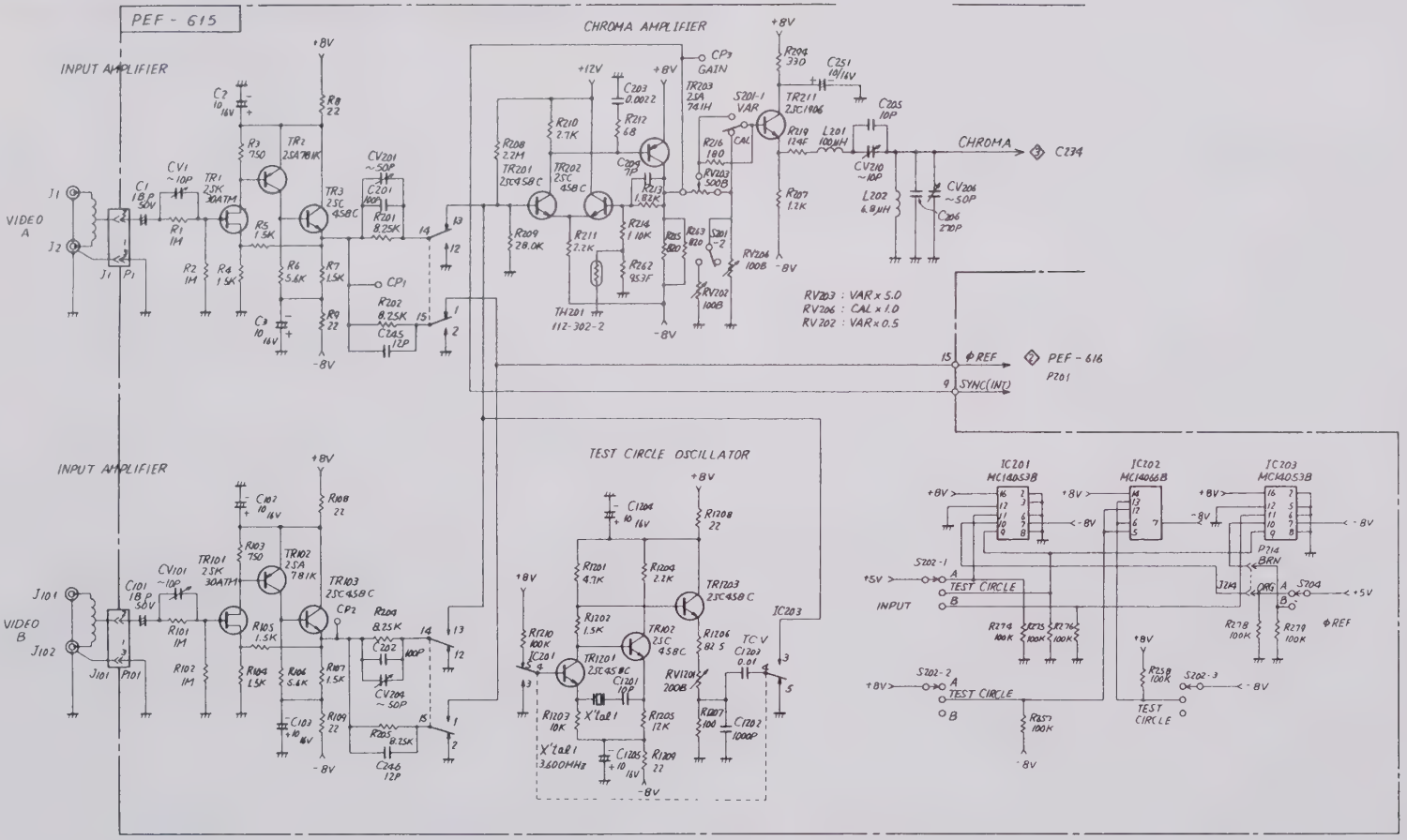
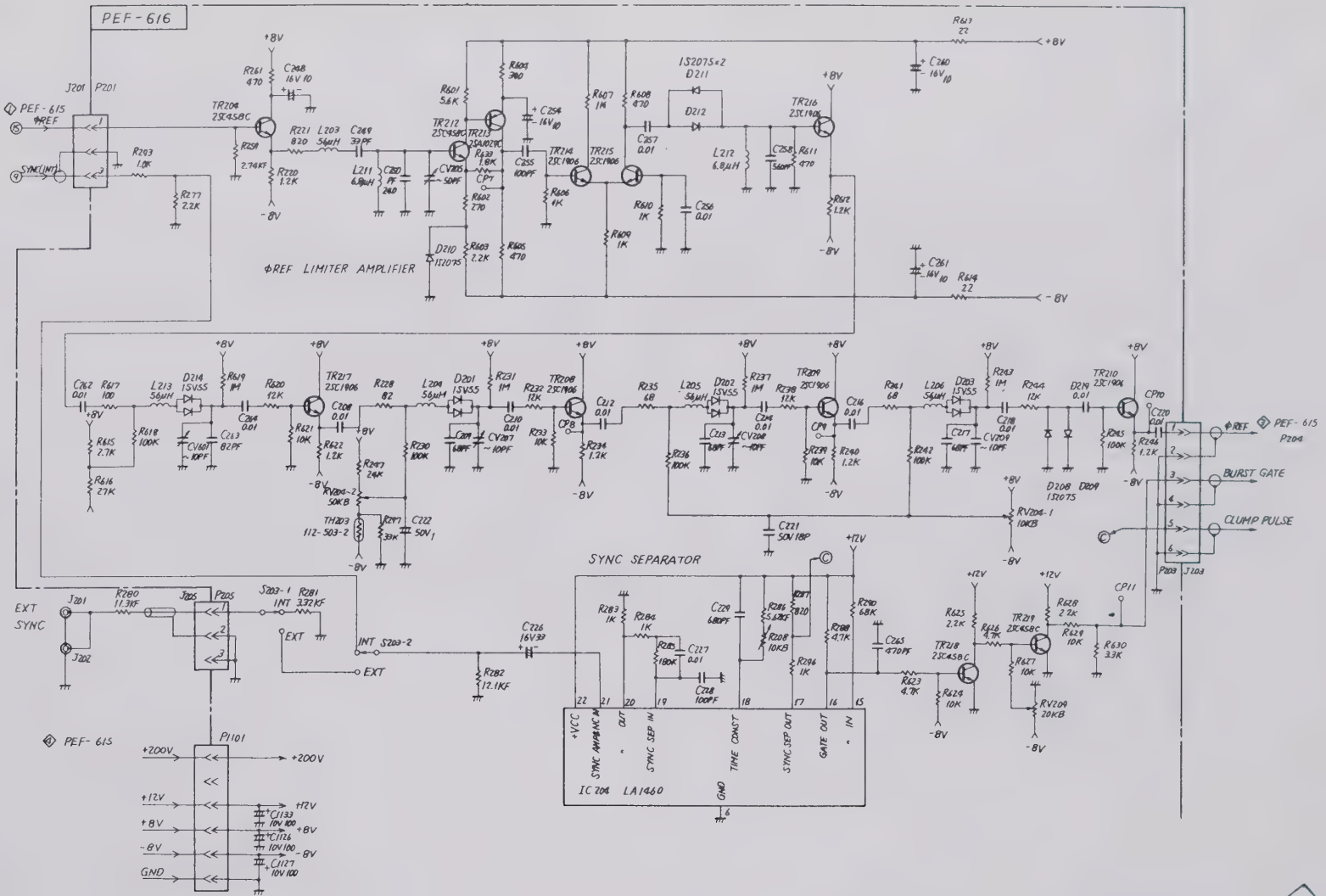


Fig. 7-2 Graticule details, red box

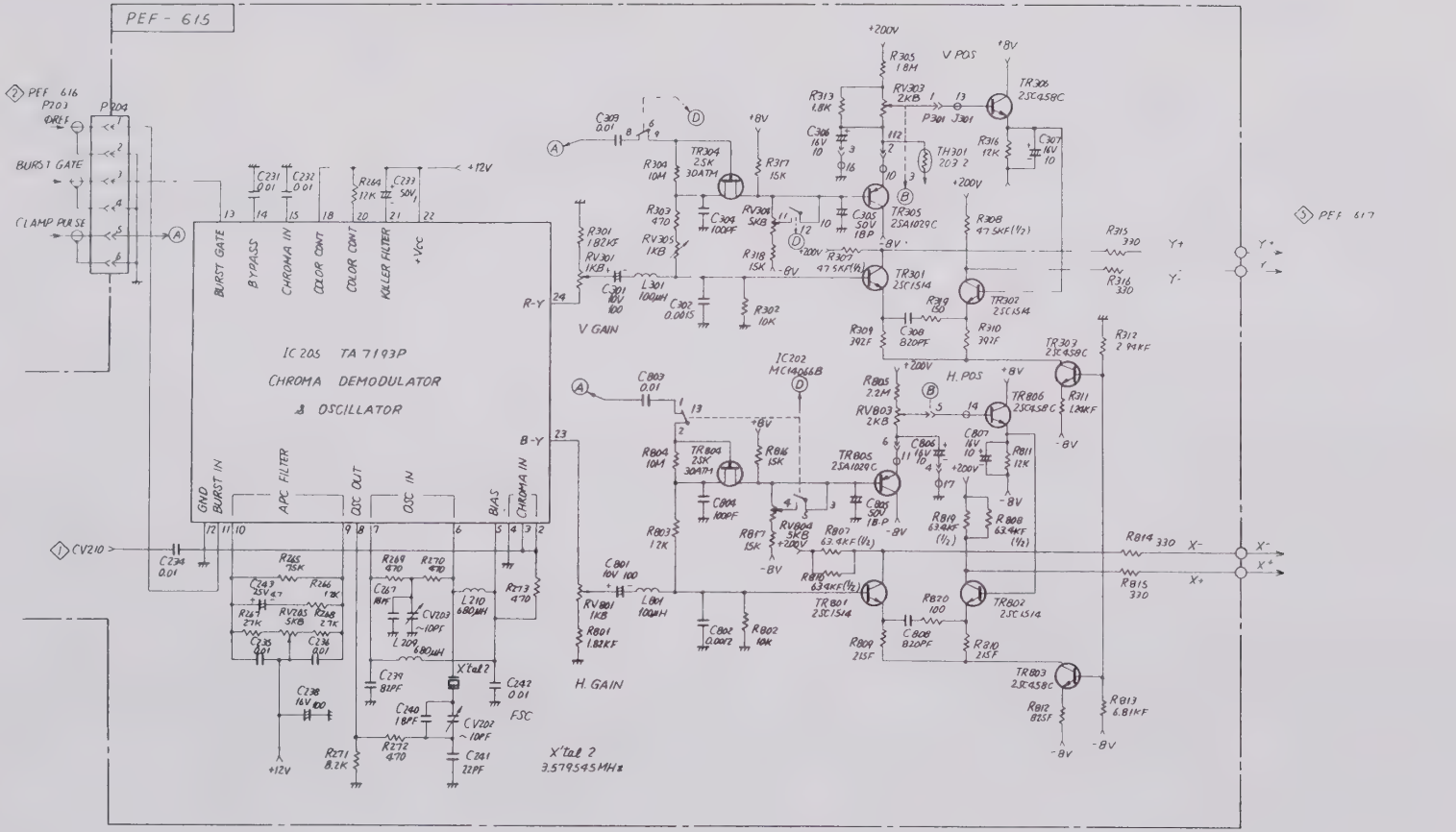
8. SCHEMATIC DIAGRAMS

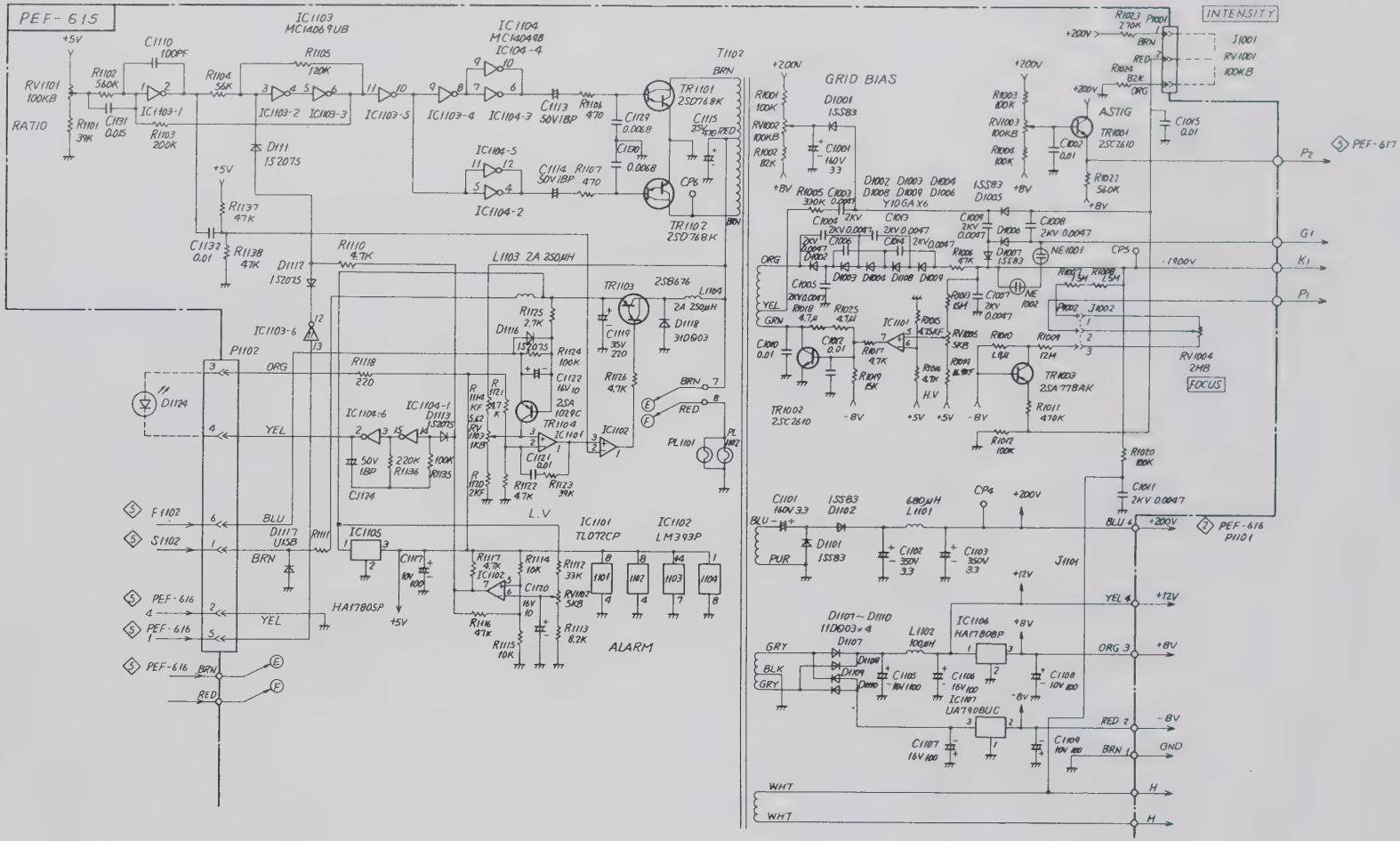


INPUT AMPLIFIER 1

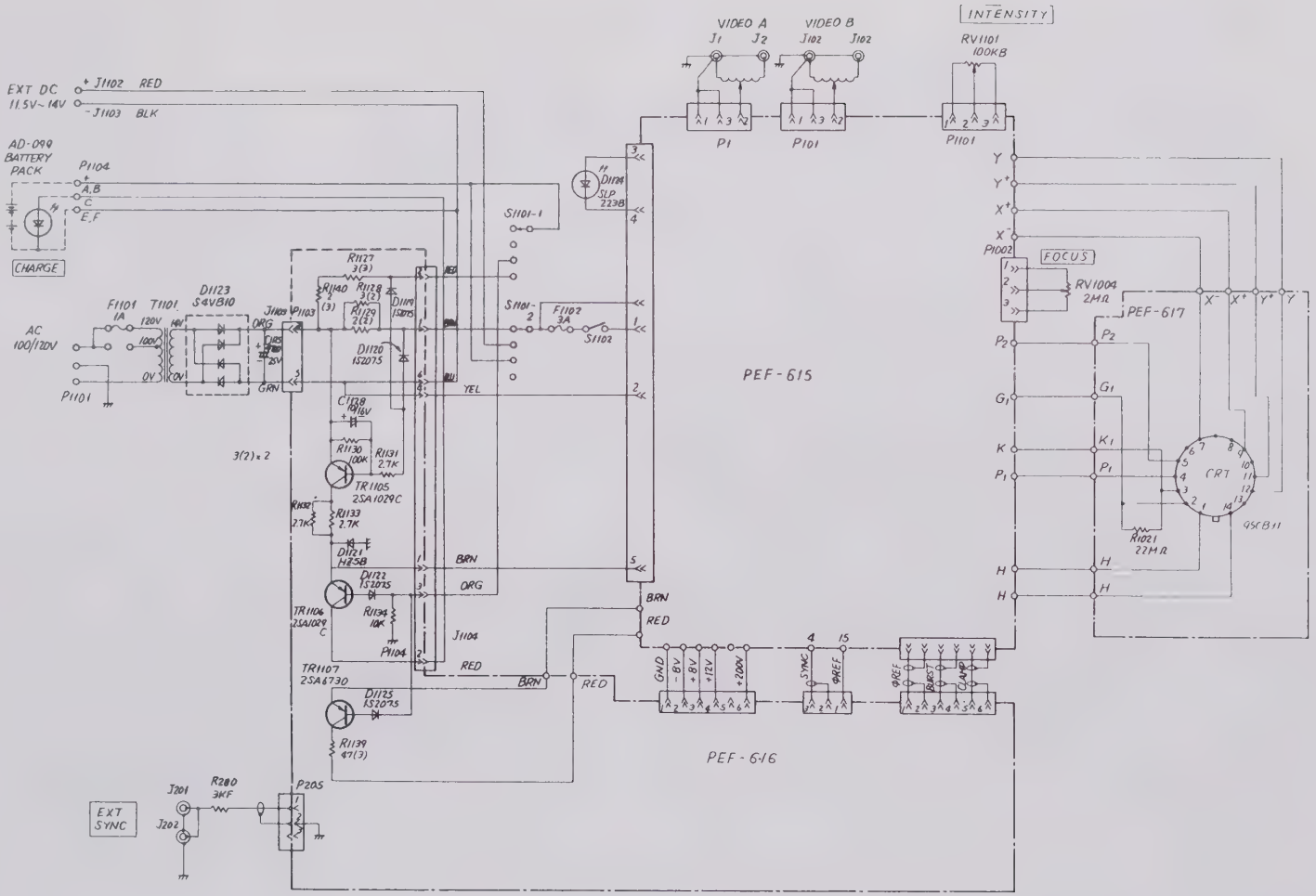

PEF-616
φREF LIMITER AMPLIFIER
SYNC SEPARATOR
IC 204 LA1460
+VCC
SYNC AMPLIFIER IN
OUT
SYNC SEP IN
TIME CONST
GND
SYNC SEP OUT
GATE OUT
IN
EXT SYNC
INT
EXT
φREF
BURST GATE
CLAMP PULSE
PEF-615 PREF
SYNC(INT)
PEF-615 P204
PEF-615 P1101
+200V
+12V
+8V
-8V
GND

φ REF, SYNC ②


PEF - 615
IC 205 TA 7193P
CHROMA DEMODULATOR
& OSCILLATOR
BURST GATE
BYPASS
CHROMA IN
COLOR CONT
COLOR CONT
KOLLER FILTER
+Vcc
GND
BURST IN
APC FILTER
OSC OUT
OSC IN
BIAS
CHROMA IN
R-Y
B-Y
V GAIN
H. GAIN
V POS
H. POS
IC202 MC14066B
X'tal 2
3.579545MHz
FSC
+200V
+8V
-8V
+12V
PEF 616
PEF 617
CV210



POWER SUPPLY 4


VIDEO A
VIDEO B
INTENSITY
EXT DC
11.5V~14V
+ J1102 RED
- J1103 BLK
AD-099
BATTERY
PACK
P1104
CHARGE
AC
100/120V
F1101
1A
T1101
D1123
S4VB10
P1101
PEF-615
PEF-616
PEF-617
FOCUS
CRT
P1
P101
P1101
P1002
RV1101
100KB
RV1004
2MΩ
R1021
22MΩ
S1101-1
S1101-2
F1102
3A
S1102
D1124
SLP
223B
D1119
1S2075
D1120
1S2075
D1121
HZ5B
D1122
1S2075
D1125
1S2075
TR1105
2SA1029C
TR1106
2SA1029
C
TR1107
2SA6730
C1138
10/16V
R1130
100K
R1131
2.7K
R1132
2.7K
R1133
2.7K
R1134
10K
R1139
47(3)
R1140
R1127
3(3)
R1128
3(2)
R1129
2(2)
3(2)×2
J1103
P1103
J1104
P1104
J1105
J201
J202
R200
3KF
P205
EXT
SYNC
GND
-8V
+8V
+12V
+200V
SYNC
ΦREF
BLANK
CLAMP
BRN
RED
ORG
YEL
GRN
BLU
WHT
GSCB11

MEMO:

MEMO:

MP MASTER
MA20667